



## 299-E33-337 (C3390)

### Log Data Report

#### Borehole Information:

<b>Borehole: 299-E33-337 (C3390)</b>			<b>Site: B Farm Perimeter</b>		
<b>Coordinates</b>		<b>GWL (ft):</b> ~260	<b>GWL Date:</b> 7/18/01		
<b>North</b> N/A <sup>3</sup>	<b>East</b> N/A	<b>Drill Date</b> 7/16/01	<b>TOC<sup>2</sup> Elevation</b> Not available	<b>Total Depth (ft)</b> 286	<b>Type</b> Air Rotary

#### Casing Information:

<b>Casing Type</b>	<b>Stickup (ft)</b>	<b>Outside Diameter (in.)</b>	<b>Inside Diameter (in.)</b>	<b>Thickness (in.)</b>	<b>Top (ft)</b>	<b>Bottom (ft)</b>
Steel-threaded drill pipe	~ 1 in	10.75	9.375	11/16	0	281

#### Borehole Notes:

This is a RCRA groundwater well that was logged through the drill pipe. There is a void space around the first 16 in. of the casing.

#### Logging Equipment Information:

<b>Logging System:</b> Gamma 1D	<b>Type:</b> SGLS (35%)
<b>Calibration Date:</b>	<b>Calibration Reference:</b>
	<b>Logging Procedure:</b> MAC-HGLP 1.6.5

<b>Logging System:</b> RLS 1	<b>Type:</b> Moisture
<b>Calibration Date:</b> 7/11/01	<b>Calibration Reference:</b> RLSM00.0
	<b>Logging Procedure:</b>

#### Spectral Gamma Logging System (SGLS) Log Run Information:

<b>Log Run</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>Repeat</b>
Date	7/18/01	7/18/01	7/19/01	7/10/01	7/10/01
Logging Engineer	Musial/Spatz	Musial/Spatz	Pearson	Spatz	Spatz
Start Depth (ft)	1	95	144	231	271
Finish Depth (ft)	96	145	232	283	241
Count Time (sec)	200	200	200	200	200
Live/Real	L	L	L	L	L
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	n/a	n/a	n/a	n/a	n/a
Pre-Verification	A0001CAB	A0001CAB	A0002CAB	A0002CAB	A0002CAB
Start File	A0001000	A0001096	A0002000	A0002089	A0002142
Finish File	A0001095	A0001146	A0002088	A0002141	A0002172
Post-Verification	A0001CAA	A0001CAA	A0002CAA	A0002CAA	A0002CAA

### **Neutron Moisture Logging System (NMLS) Log Run Information:**

Log Run	1	2	3	Repeat	
Date	7/24/01	7/24/01	7/24/01	7/24/01	
Logging Engineer	Spatz/Musial	Musial/Spatz	Musial/Spatz	Spatz	
Start Depth (ft)	1	124	248.0	260	
Finish Depth (ft)	125	249	260.25	229.75	
Count Time (s)	n/a	n/a	n/a	n/a	
Live/Real	n/a	n/a	n/a	n/a	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	0.25	0.25	0.25	0.25	
ft/min	1.0	1.0	1.0	1.0	
Pre-Verification	C0072CAB	C0072CAB	C0072CAB	C0072CAB	
Start File	C0072000	C0072497	C0082000	C0082055	
Finish File	C0072496	C0072997	C0082054	C0082176	
Post-Verification	C0082CAA	C0082CAA	C0082CAA	C0082CAA	

### **Logging Operation Notes:**

A longer count time (200 sec) was required with the SGLS because of the relatively thick casing. In order to obtain reliable spectra while minimizing overall logging time, the depth interval was increased from 0.5 ft to 1.0 ft.

SGLS log depths are relative to ground level. Two logging runs occurred on both 7/18/01 and 7/19/01 because the liquid nitrogen needed to be recharged. Start of log spectra is at 1 ft below ground surface. Depth to water is about 261 ft. No fine gain adjustments were made during this log run (7/19/01). The hole is open at the end of the drill pipe at 281 ft.

Neutron moisture logs were run on 7/24/01 using the RLS 1, and log depths are relative to ground level. The neutron moisture tool was run centralized.

### **Analysis Notes:**

<b>Analyst:</b>	Sobczyk	<b>Date:</b>	07/27/01	<b>Reference:</b>	
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Pre-run and post run verification spectra for the SGLS were evaluated, and the tool was found to be functioning normally. Individual spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL. Corrections were applied for a casing thickness of 11/16 in. from the ground surface to 281 ft. No casing correction was applied at 282 and 283 ft. A correction for water in the borehole was applied at and below 261 ft. Dead time corrections were not necessary.

Moisture calibration models at Hanford for 10-in. holes with ¾-in. casing have not been established. Thus, the neutron log was not processed to estimate volumetric moisture content because the relatively large borehole diameter and casing thickness are beyond the range of conditions for which the tool was calibrated. Neutron data are presented as gross counts. In general, an increase in neutron count is indicative of an increase in moisture content, but a quantitative calculation of volumetric moisture cannot be made at this time.

## **Log Plot Notes:**

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides ( $^{40}\text{K}$ ,  $^{232}\text{Th}$ ,  $^{238}\text{U}$ , and associated decay progeny), and man-made radionuclides. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable activity (MDA) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing and water corrections. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. A neutron moisture log of neutron counts is also shown on the combination plot.

## **Results and Interpretations:**

$^{137}\text{Cs}$  was the only man-made radionuclide that was detected. The only  $^{137}\text{Cs}$  concentration occurs at 1 and 2 ft below ground surface. The measured  $^{137}\text{Cs}$  concentration is about 0.4 pCi/g.

The changes in gross gamma counts depend primarily upon changes in  $^{40}\text{K}$  concentrations. The increase in gross gamma counts from about 83 cps to about 100 cps at a log depth of 54 ft corresponds with an increase in apparent  $^{40}\text{K}$  concentrations from about 11 pCi/g to 14 pCi/g. Similarly, the decrease in gross gamma counts from 90 cps to 80 cps at a log depth of 218 ft corresponds to a decrease in  $^{40}\text{K}$  concentrations from about 13 pCi/g to 11 pCi/g. The abrupt decrease in total gamma counts at a log depth of 261 ft is due to the increased shielding of the detector by groundwater in the borehole. The apparent increase in gross gamma counts at the bottom of the hole (282 ft and 283 ft) occurs because the detector is not being shielded by the drill pipe.

The neutron moisture log showed relatively little response. This lack of response is due at least in part to the low-activity source, short source-to-detector spacing, and large borehole diameter. The slightly elevated neutron cps that occurs between about 19 and 30 ft corresponds with an interval of relatively high total gamma. This zone is interpreted as a layer of finer grained sediments surrounded by coarser sediments. The highest neutron counts occurred in the 121- to 125-ft interval. This interval corresponds with a slight drop in total gamma and  $^{40}\text{K}$  activity. An overlap between logging runs one and two occurred between 124 and 125 ft. There was good agreement between the two runs in this overlap.

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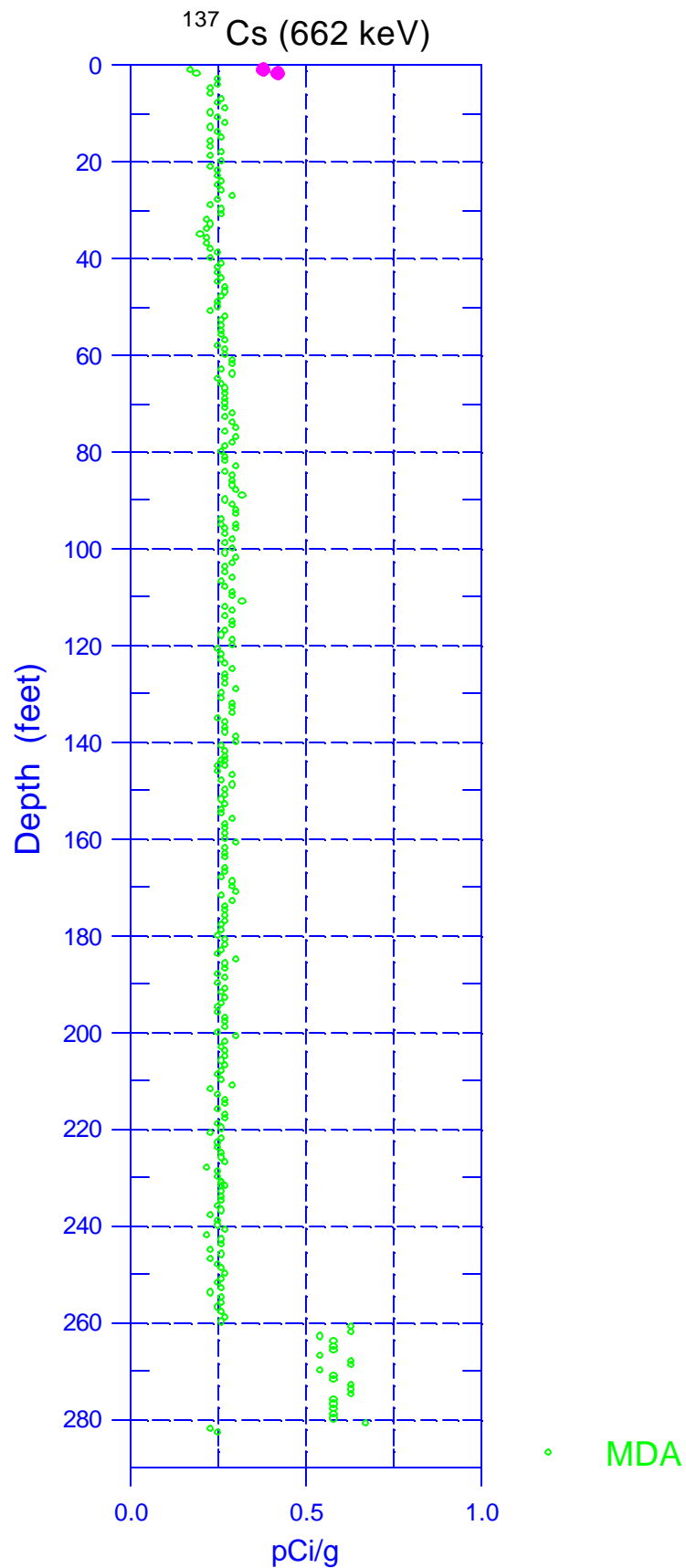
<sup>1</sup> GWL – groundwater level

<sup>2</sup> TOC – top of casing

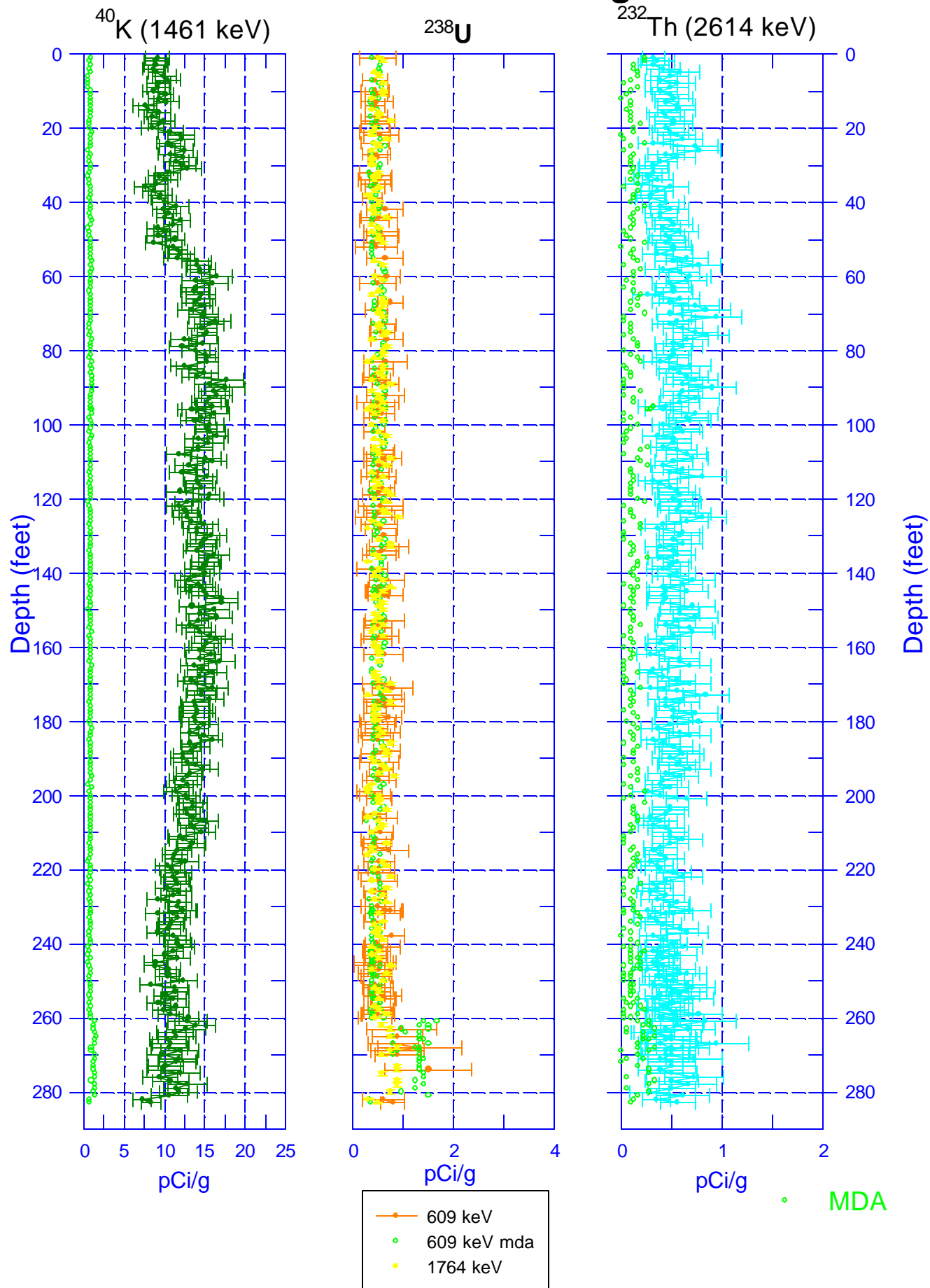
<sup>3</sup> N/A – not applicable

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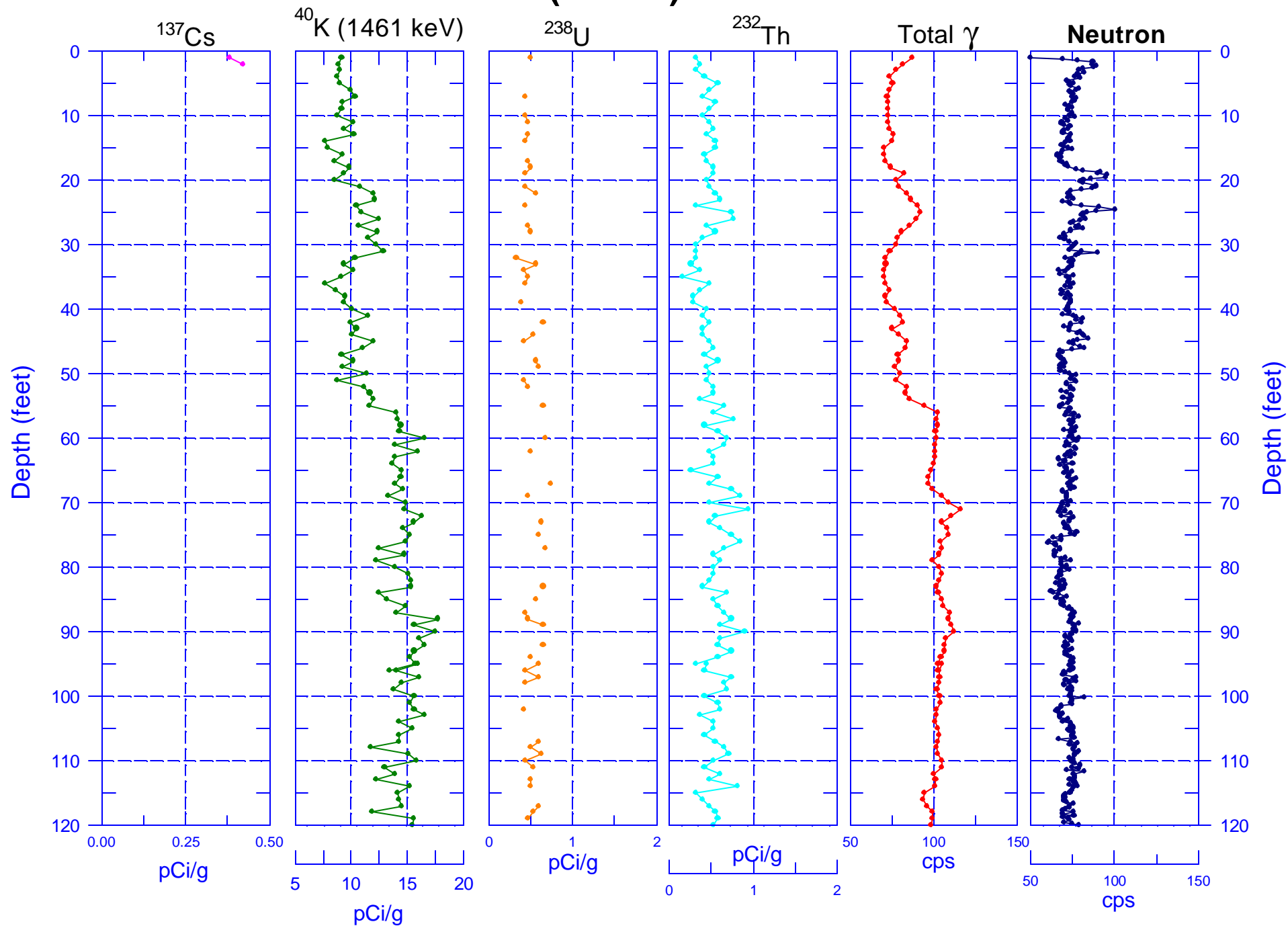
## Man-Made Radionuclide Concentrations



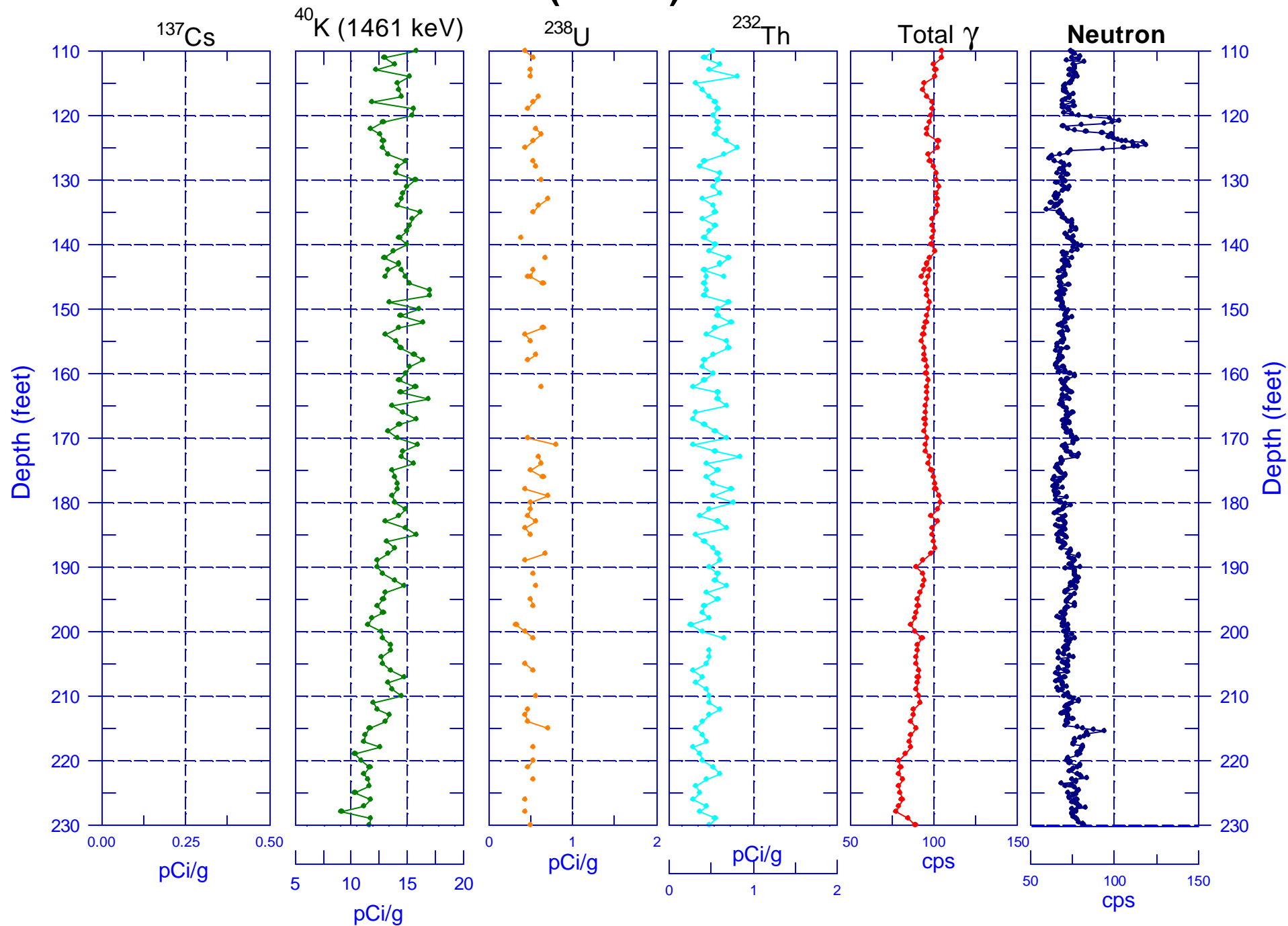
# 299-E33-337 (C3390) Natural Gamma Logs



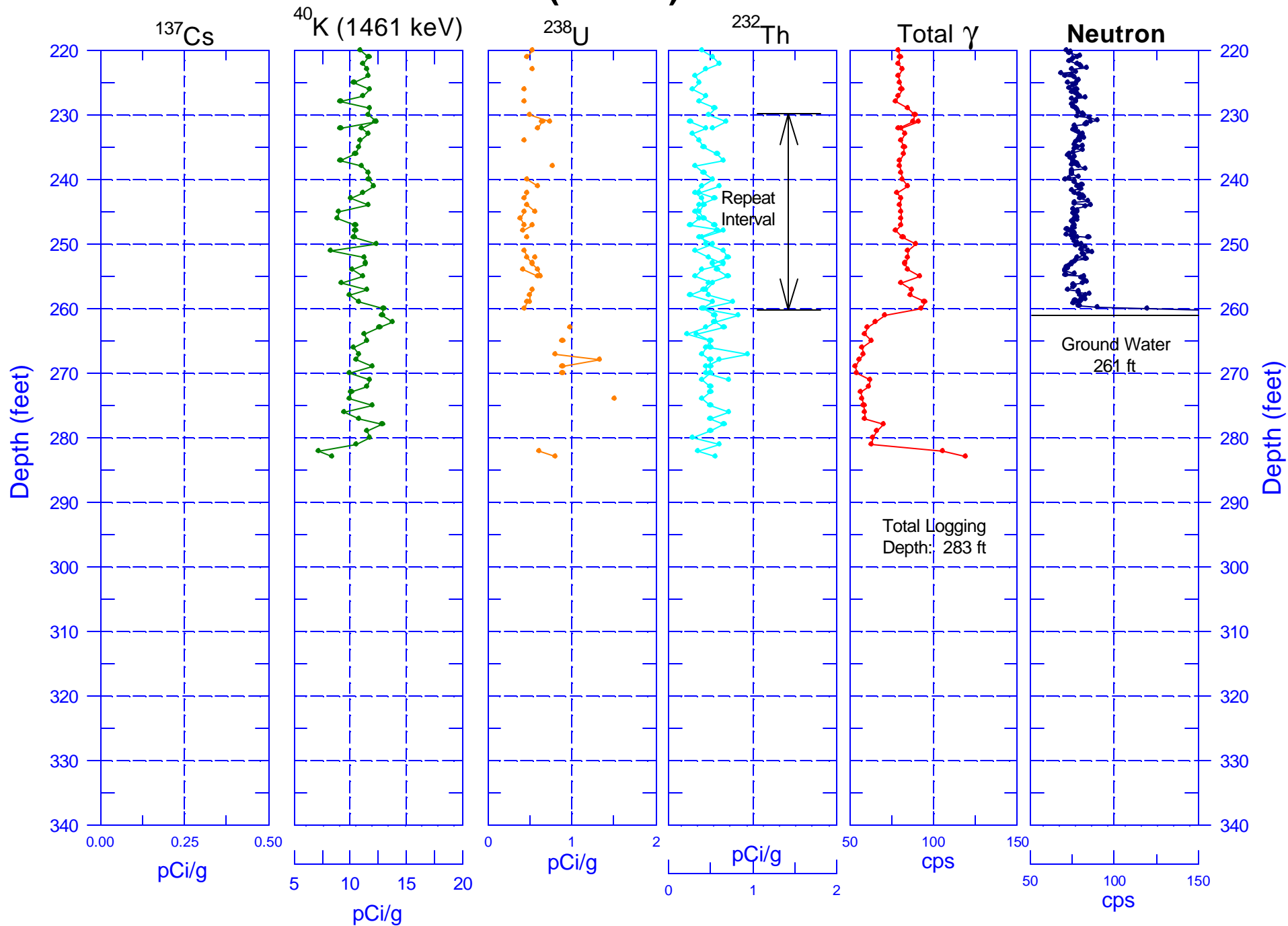
# 299-E33-337 (C3390) Combination Plot



# 299-E33-337 (C3390) Combination Plot



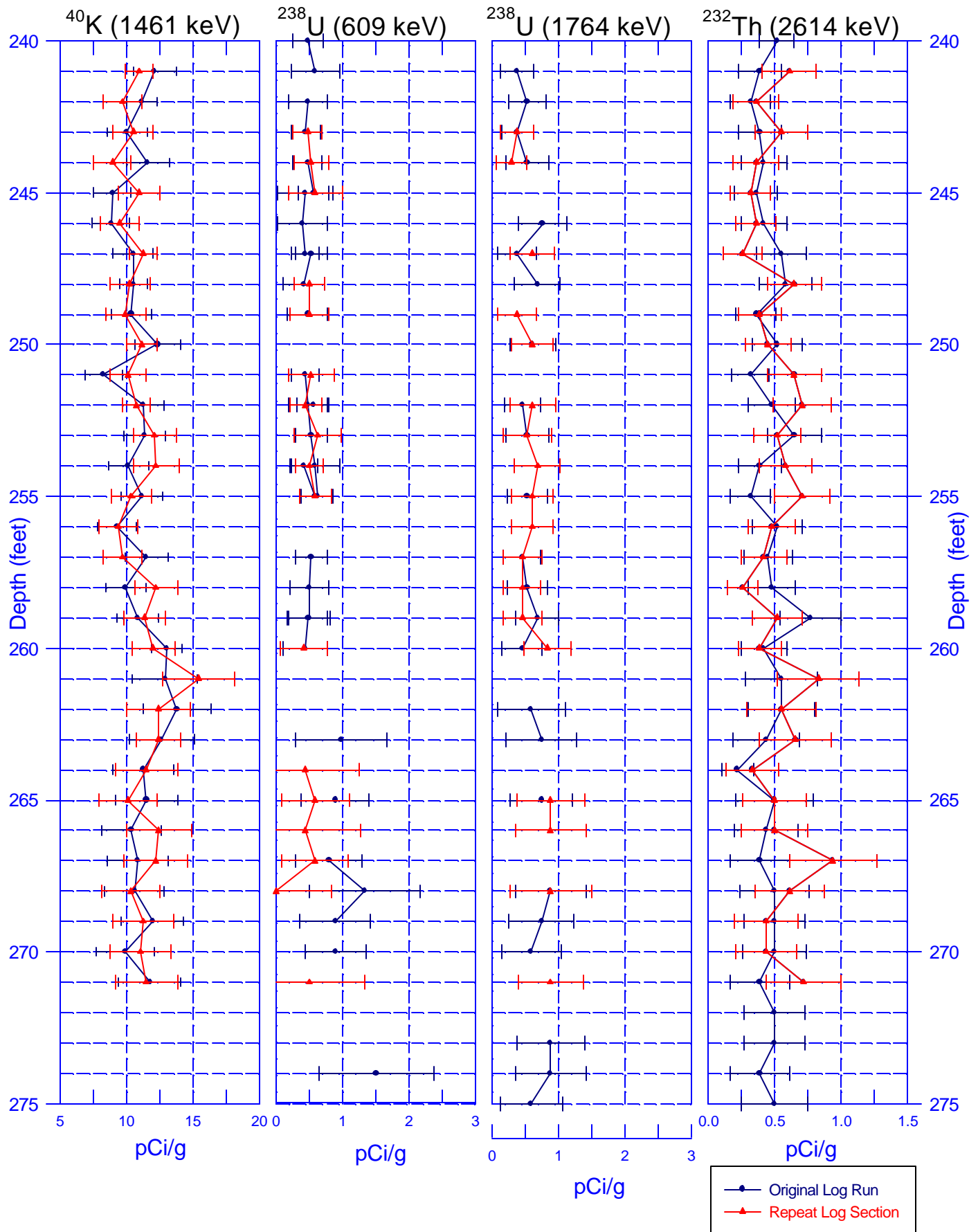
# 299-E33-337 (C3390) Combination Plot





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## Rerun Section of Man-Made and Natural Gamma Logs



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